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Headquarters U.S. Air Force

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Survivability & Vulnerability Impacts on Mission and Campaign Outcomes: *The Role of the AFSAT*



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**Sharon Nichols
George Crowder (Ctr)
AFSAA/SAAT**



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Outline

- **AFSAT**
- **SURVIAC**
- **Engineering & Engagement Level Analysis for Survivability & Vulnerability (S&V)**
- **S&V Impacts on Mission Level Analysis**
- **S&V Impacts on Campaign Level Analysis**
- **Consistent Scenarios, CONOPS, and Approach**
- **AFSAT Value Added**



- **The Air Force Standard Analysis Toolkit (AFSAT)**
- **Foundational set of AF analytic community (AFAC) accepted modeling and simulation (M&S) tools**
 - **Stand-alone, data driven constructive simulations**
 - **User picked, well understood, formally evaluated (stamp of approval)**
 - **Use of AFSAT tools encouraged**
- **Goals**
 - **Improve consistency and quality of AF analyses**
 - **Standardize model management, configuration management, VV&A, etc. *best practices* across the AF analytic community**
 - **Provide framework for analytic M&S capability investments**
- **Oversight**
 - **AFAC Steering Group provides direction and guidance**
 - **AFSAA/SAA – executive agent**
 - **Subject Matter Expert model managers (MM) responsible for individual models**



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Background: Why Created?

Answering the Questions Without an Analysis Toolkit

Numerous Analysis Tools

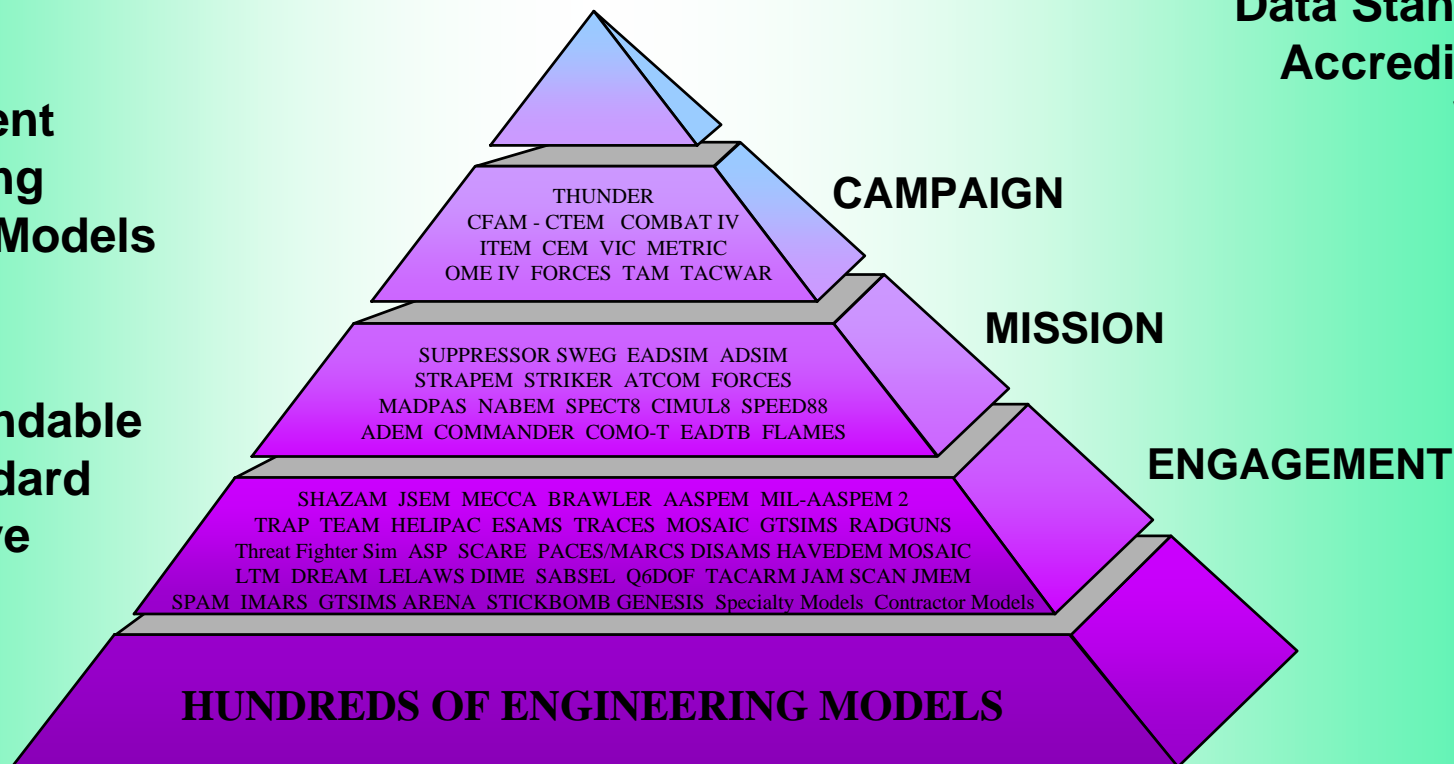
Campaign
Mission
Engagement
Engineering
Specialty Models

Issues

Non-Defendable
Non-Standard
Duplicative

Mandates

Data Standards
Accreditation
VV&A



Analysis

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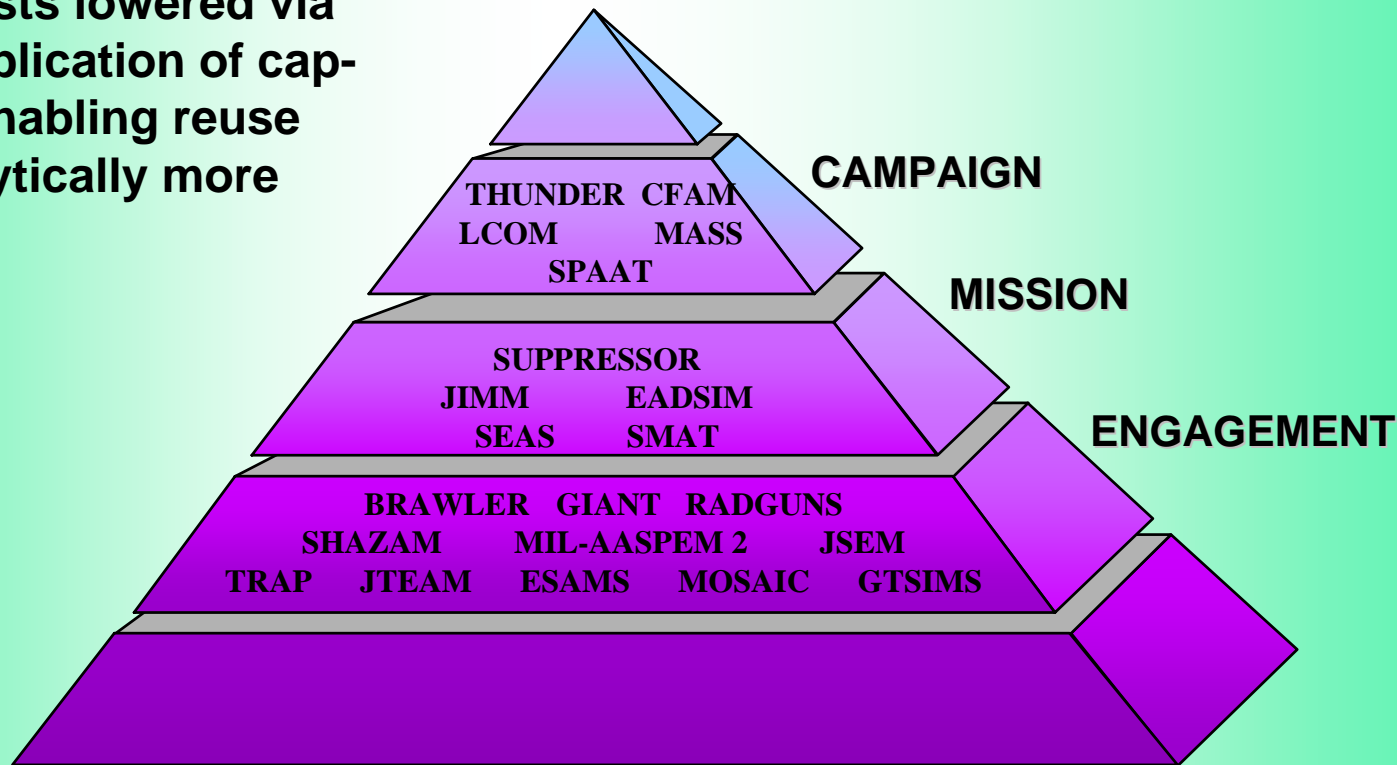


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AFSAT Approach

AF Analyses Benefits

**Life cycle costs lowered via
reduced duplication of cap-
ability via enabling reuse
Results analytically more
consistent**



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SURVIAC

Survivability/Vulnerability IAC

- DoD sponsored Information Analysis Center (IAC)
- DoD's institution for collecting, analyzing, and disseminating scientific and technical information (STI) related to all aspects of survivability and lethality for aircraft, ground vehicles, ships and spacecraft, to conventional homeland security threats including chemical, biological, directed energy, and non-lethal weapons.
- Contractor operated, DoD sponsored service available to all government and industry users to provide studies, analyses, data gathering, and other operational, and logistics requirements related to survivability and lethality technologies.
- Includes maintenance and distribution of approved set of models and simulations used to evaluate survivability and vulnerability.

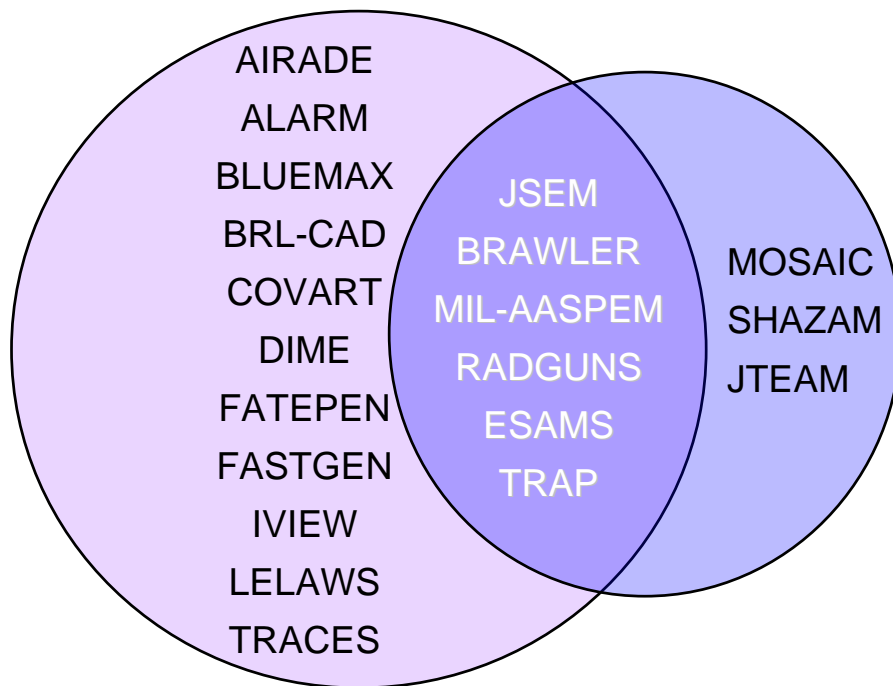


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AFSAT and SURVIAC M&S

How are they related?

SURVIAC



AFSAT
Engagement
Level Models



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Aircraft Survivability

Where the Rubber Meets the Road

Work backwards—understand the physics and effects

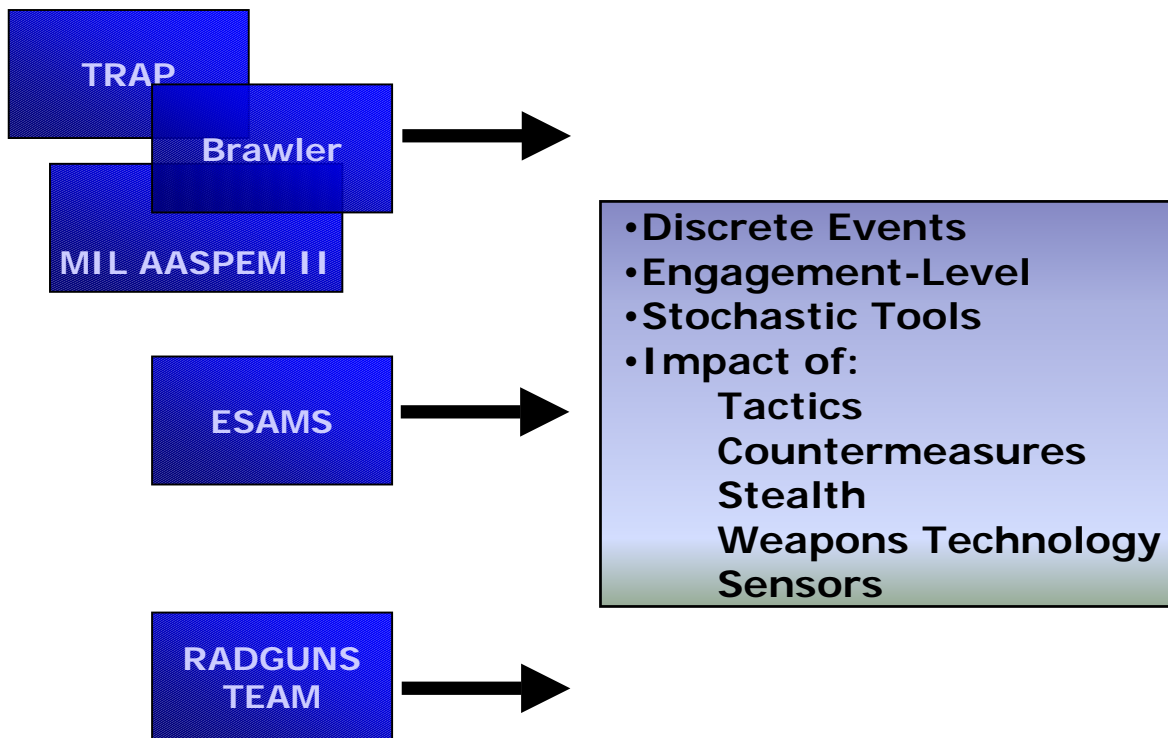




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Survivability & Vulnerability

Engineering & Engagement Level Analysis



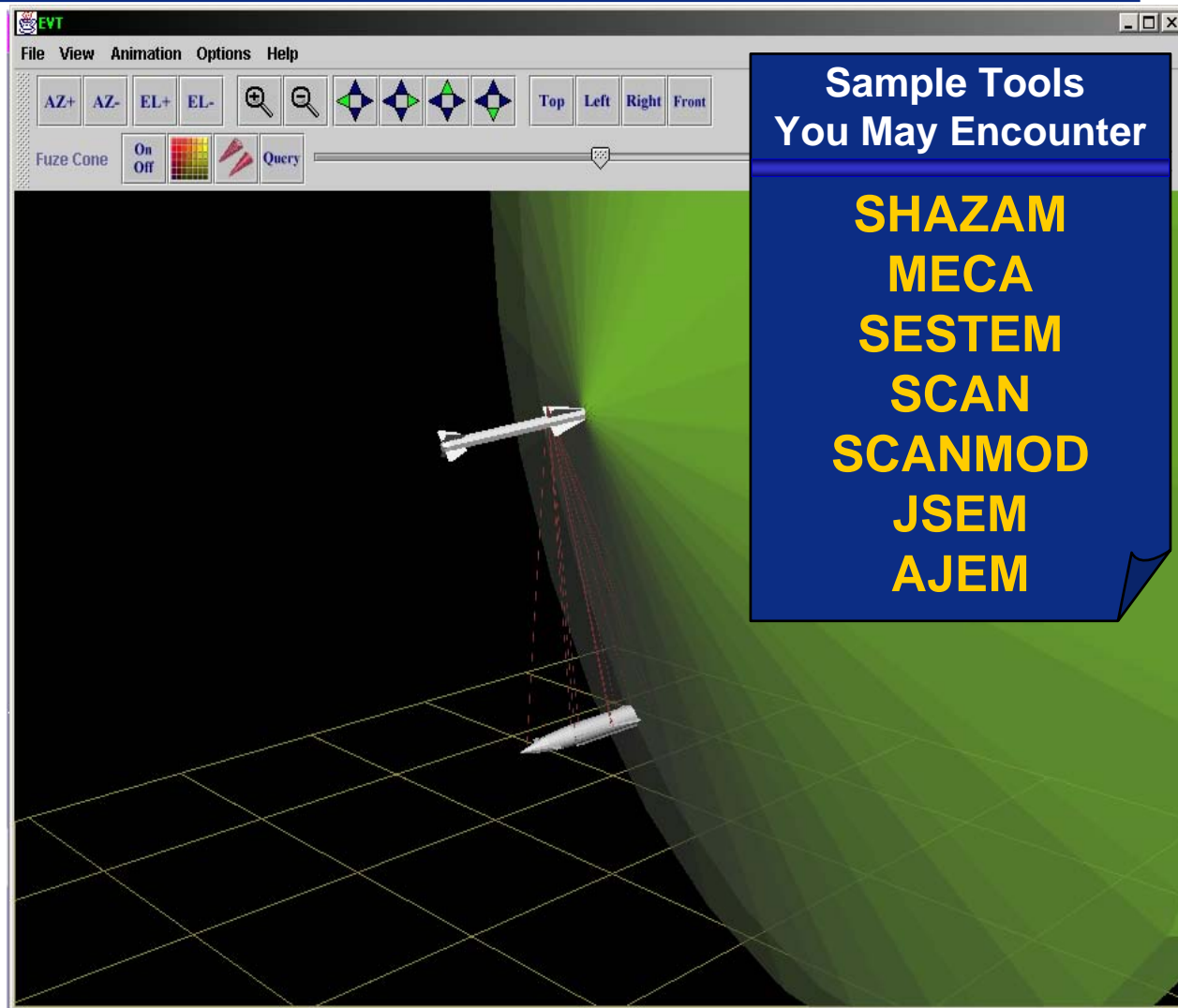


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Engineering-Level

The Munitions: Endgame

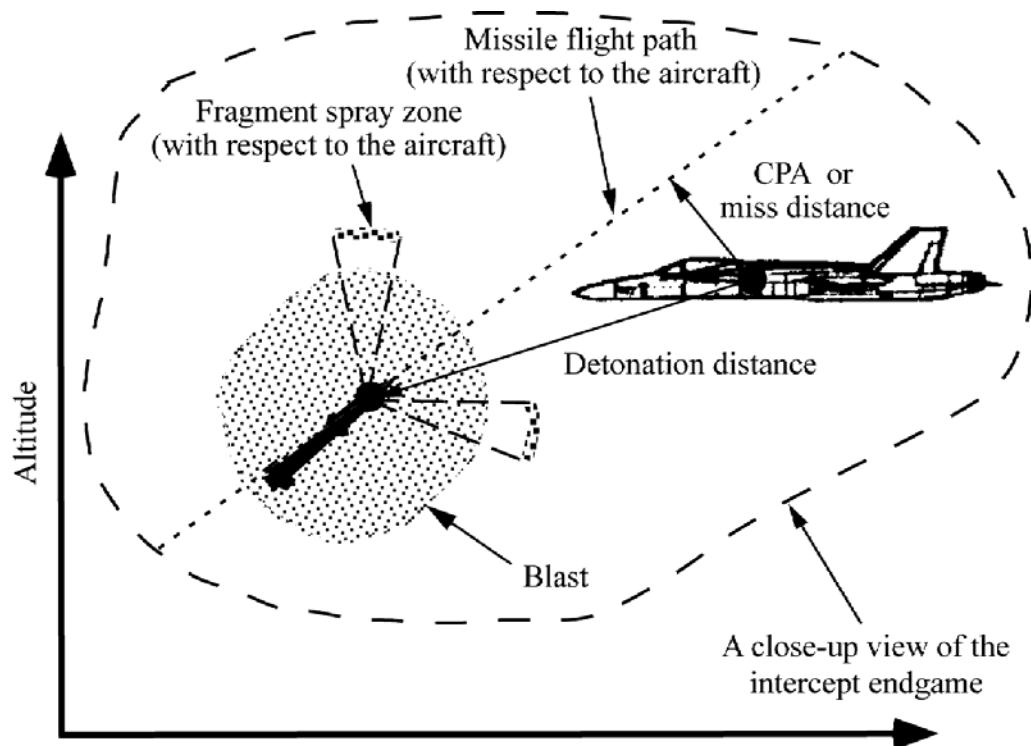
- Terminal effectiveness of fragmenting munitions
- 3D terminal-encounter simulation
 - Last few milliseconds (fuzing/warhead interaction)
- Calculates aerial target kill by threat missile (Pkss)
- Accounts For Major Damage Mechanisms
 - Direct Hit
 - External Blast
 - Warhead Frag





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Engineering-Level Summary

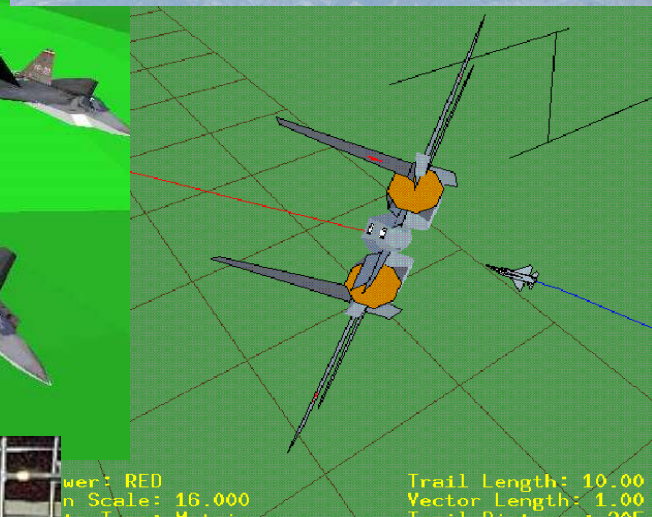
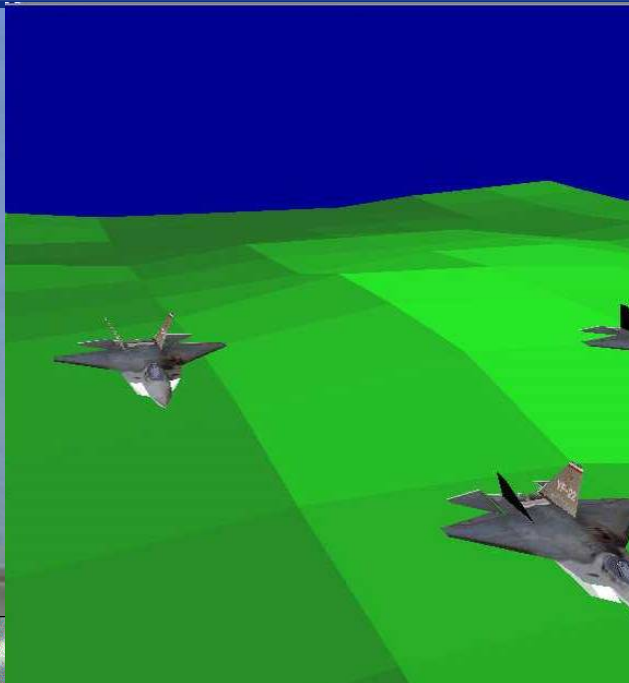




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Engagement-Level

Aggregating Engineering-Level to Few-v-Few

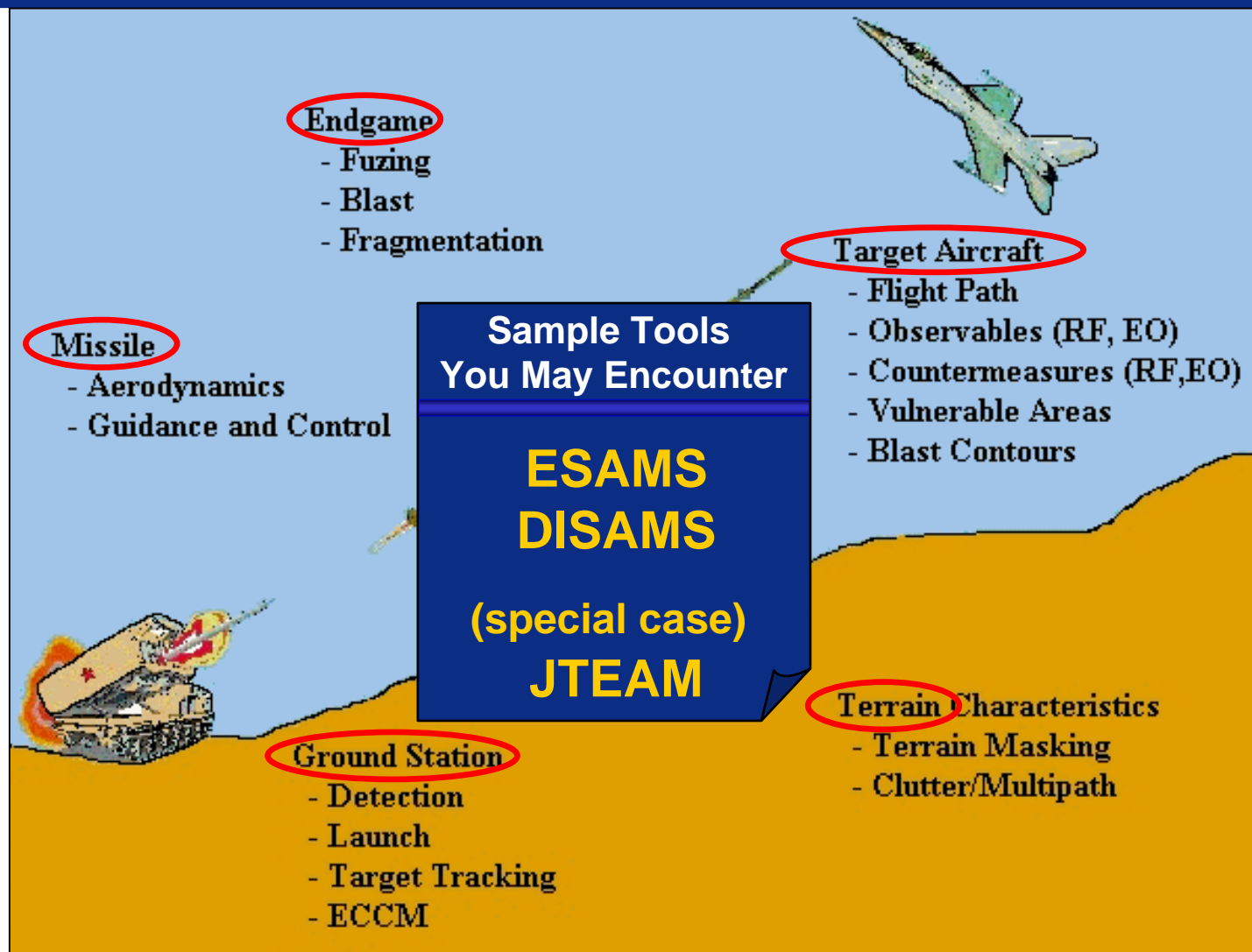




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Engagement-Level

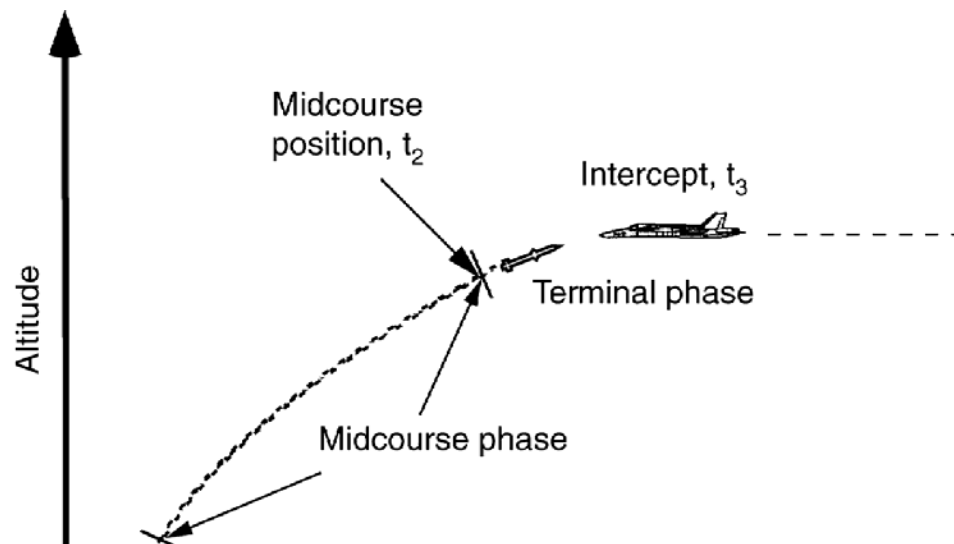
Surface-to-Air Missile





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Engagement-Level *Few-v-Few Summary*



SHAZAM JSEM MECCA BRAWLER AASPEM MIL-AASPEM 2
TRAP TEAM HELIPAC ESAMS TRACES MOSAIC GTSIMS RADGUNS
Threat Fighter Sim ASP SCARE PACES/MARCS DISAMS HAVEDEM MOSAIC
LTM DREAM LELAWS DIME SABSEL Q6DOF TACARM JAM SCAN JMEM
SPAM IMARS GTSIMS ARENA STICKBOMB GENESIS Specialty Models Contractor Models

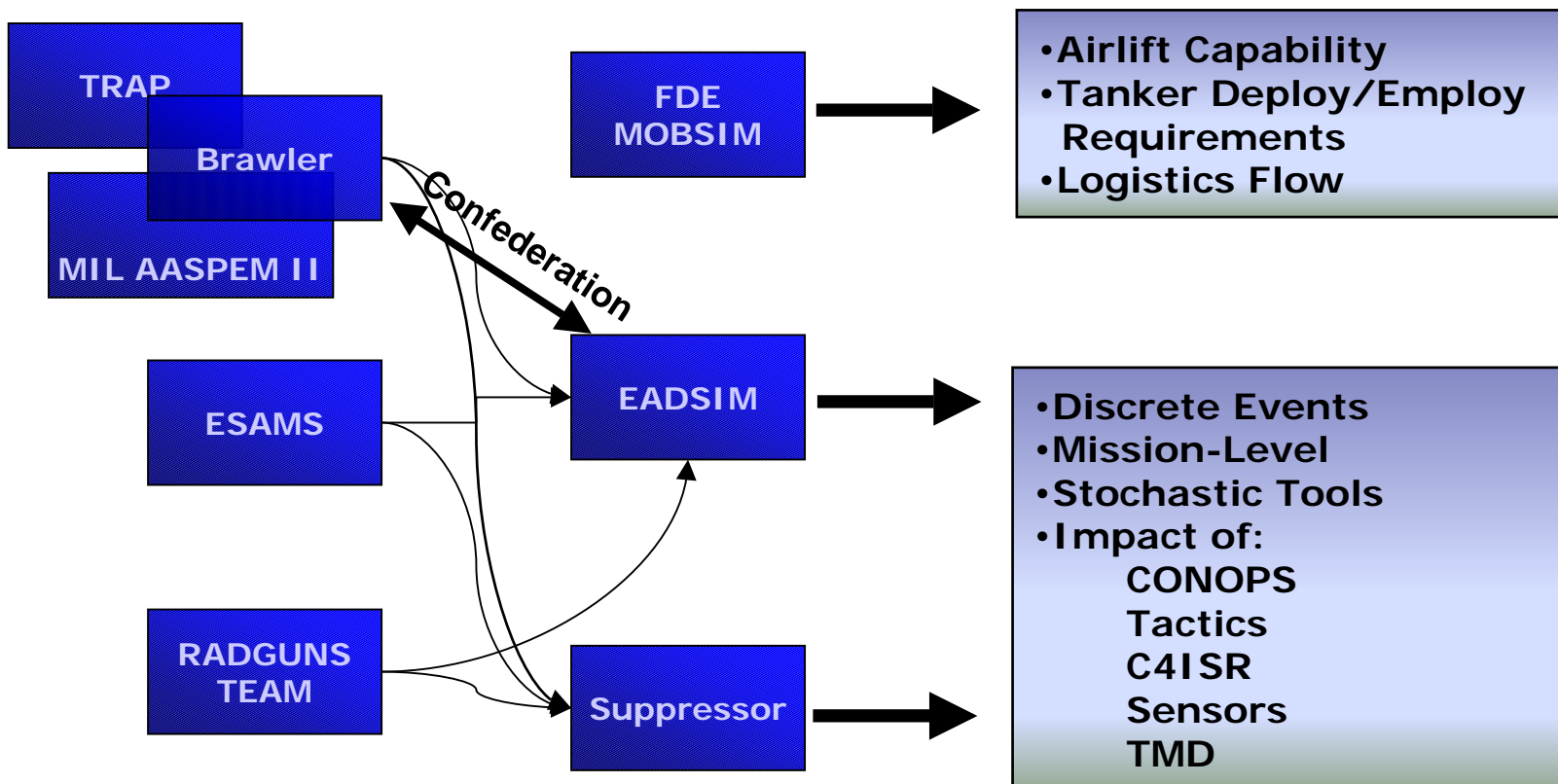
HUNDREDS OF ENGINEERING MODELS



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Survivability & Vulnerability:

Impacts on Mission Level Analysis

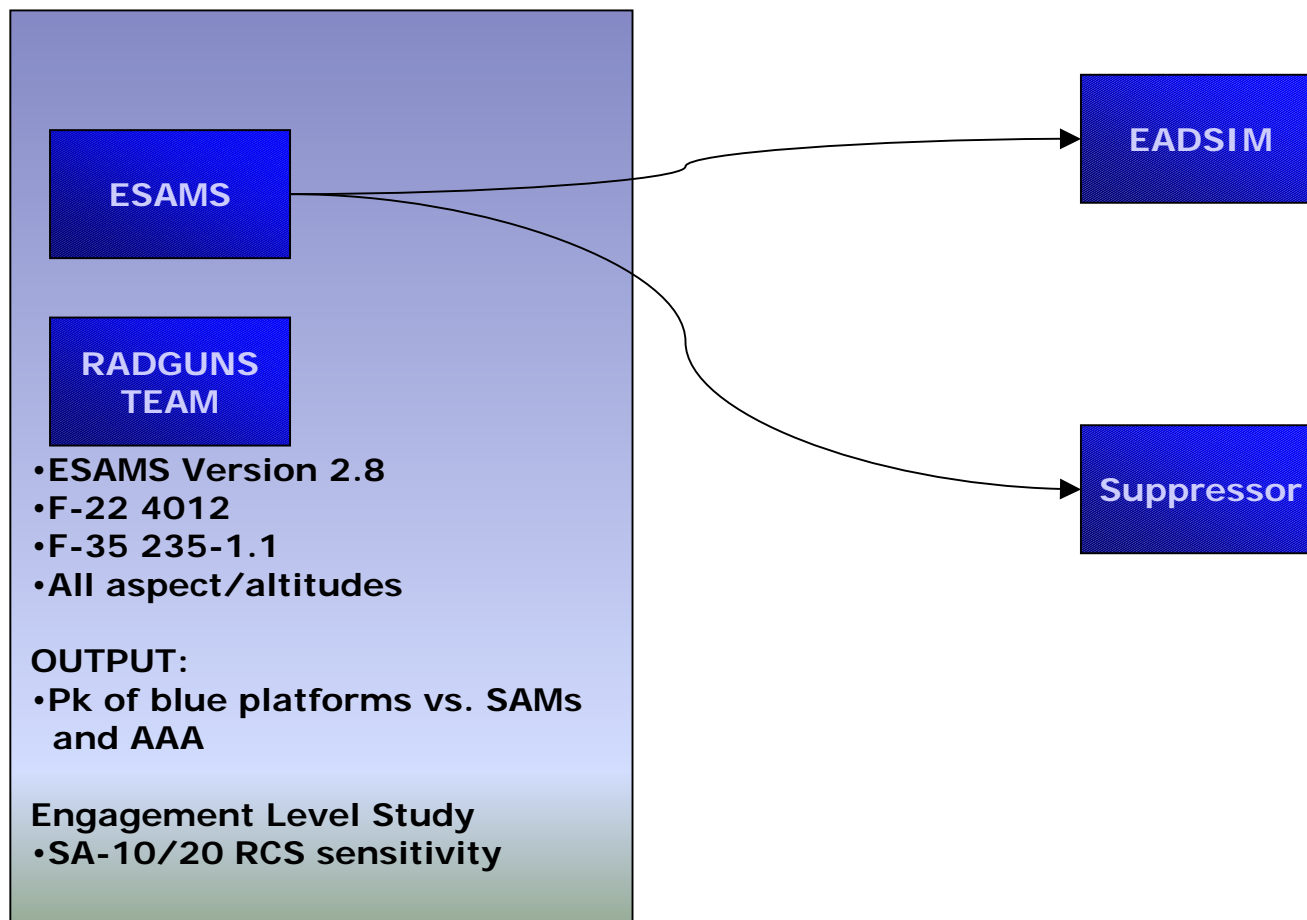




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ESAMS, RADGUNS and JTEAM

Input to EADSIM & Suppressor

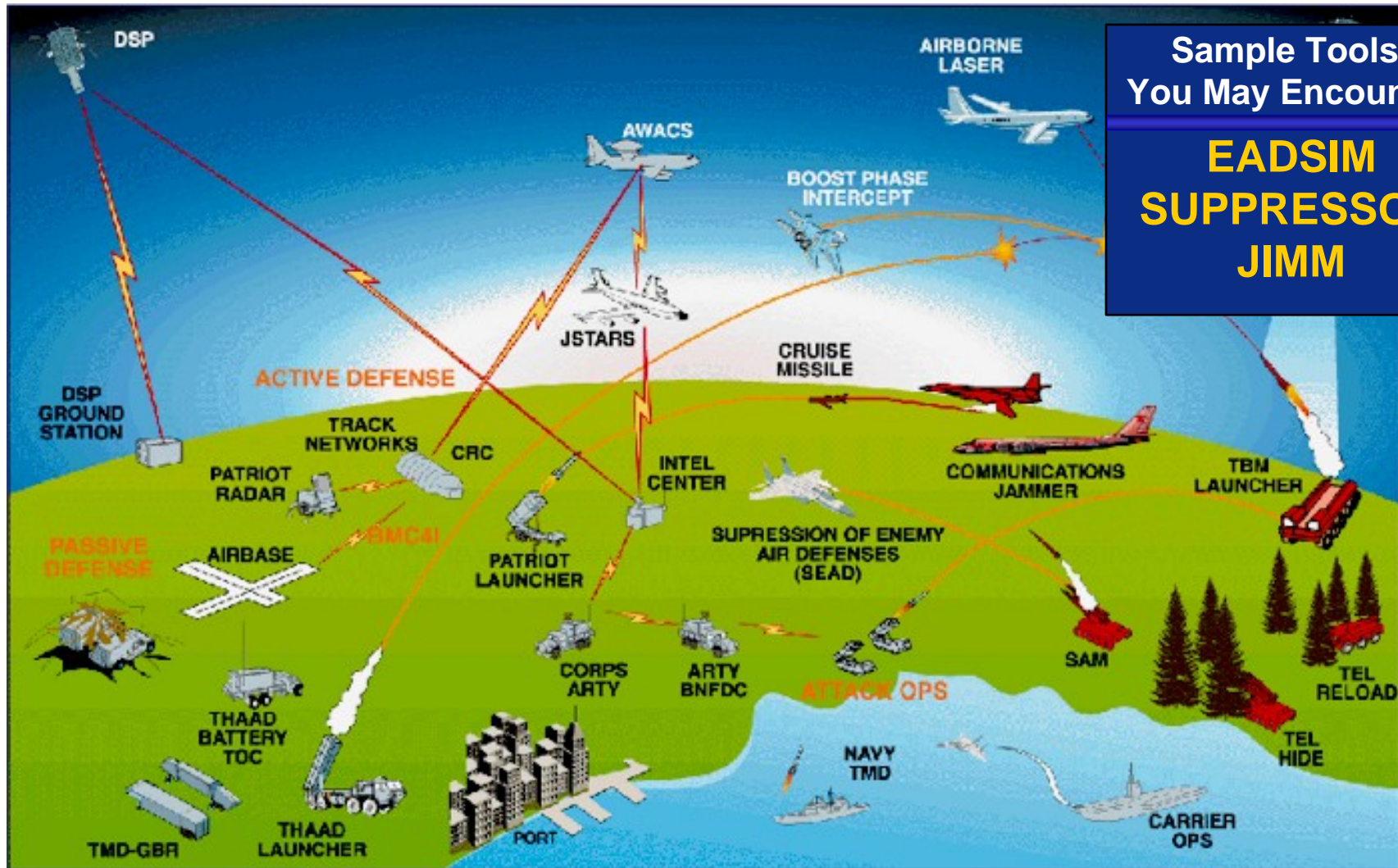




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Mission-Level

Many-on-Many



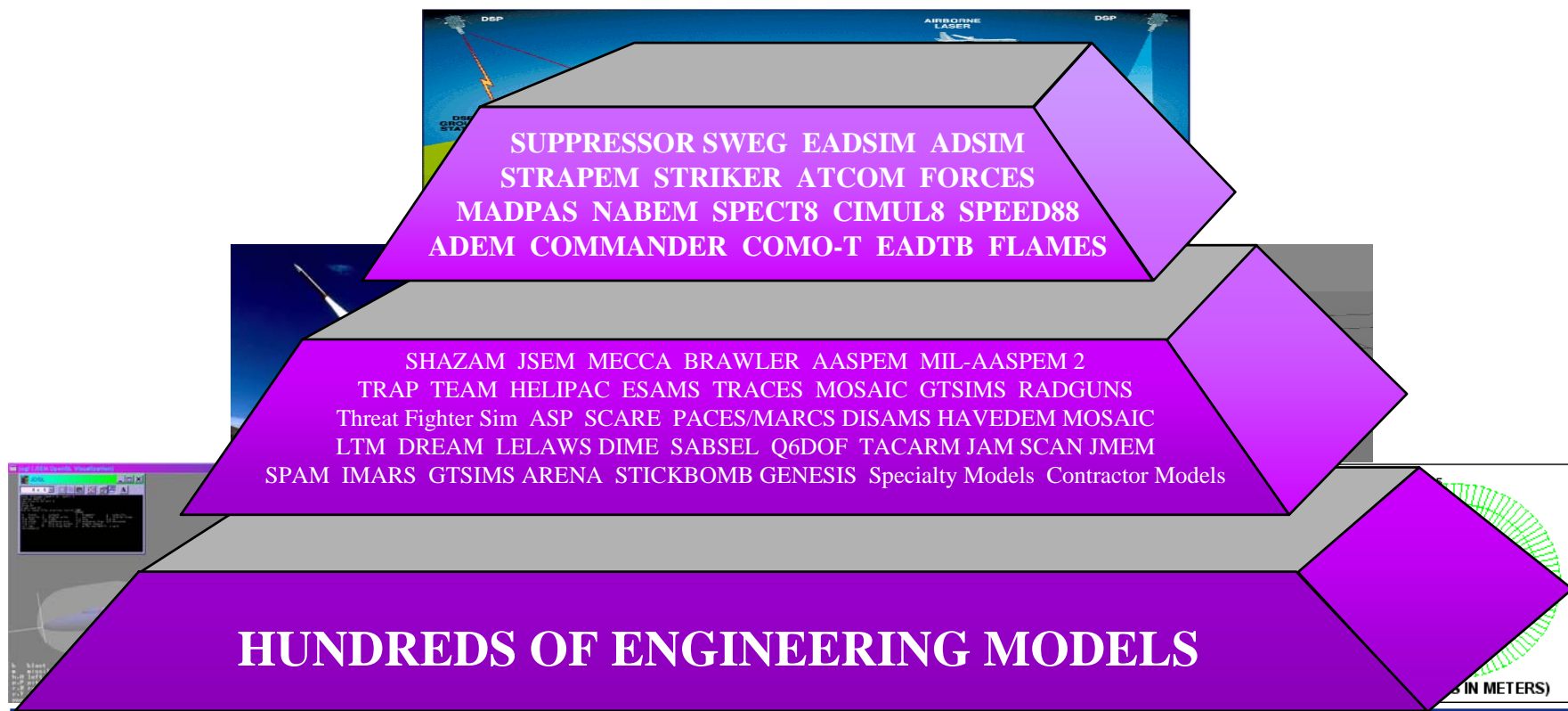
Sample Tools
You May Encounter

EADSIM
SUPPRESSOR
JIMM



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Mission-Level *Many-v-Many Summary*

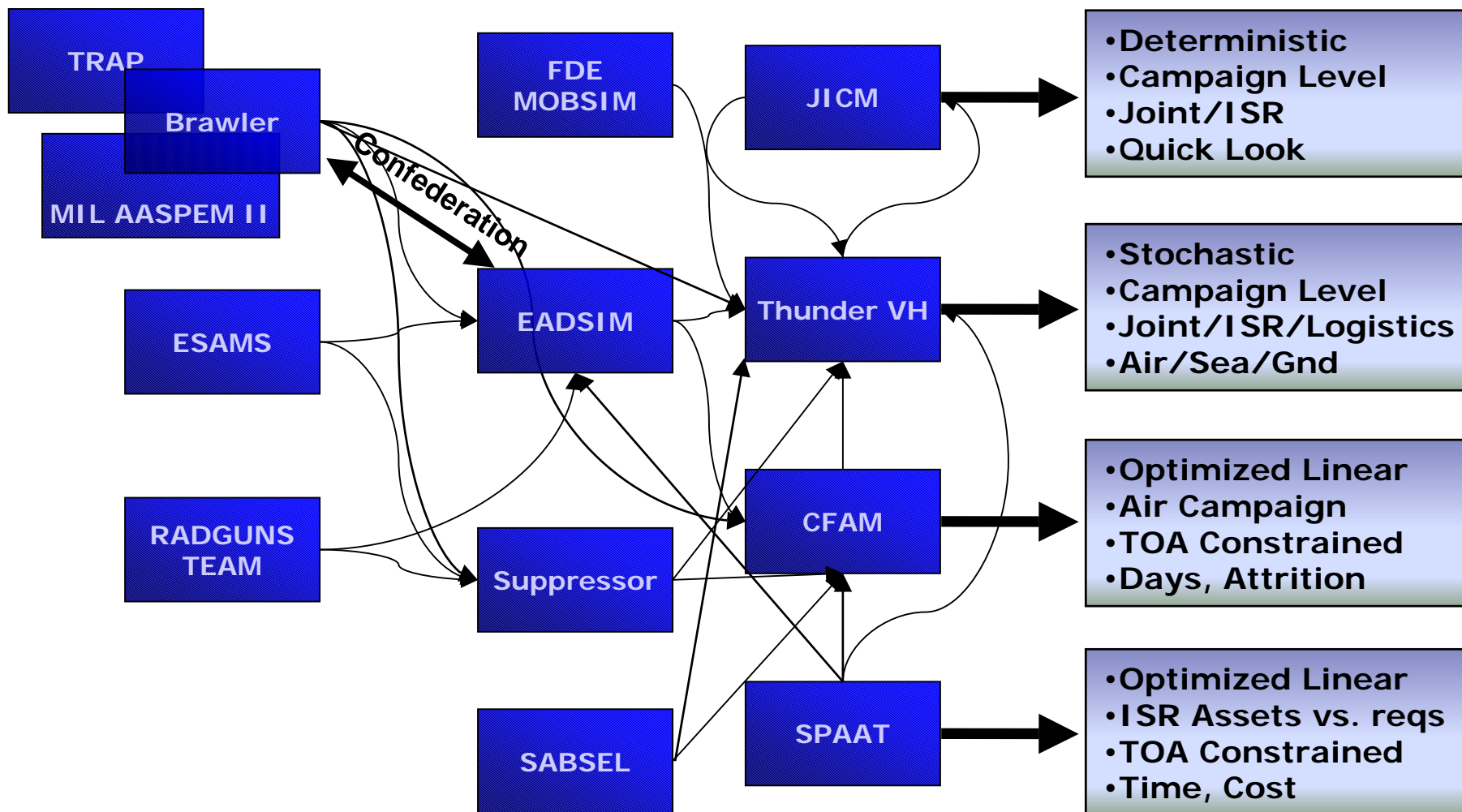




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Survivability & Vulnerability:

Impacts on Campaign Level Analysis

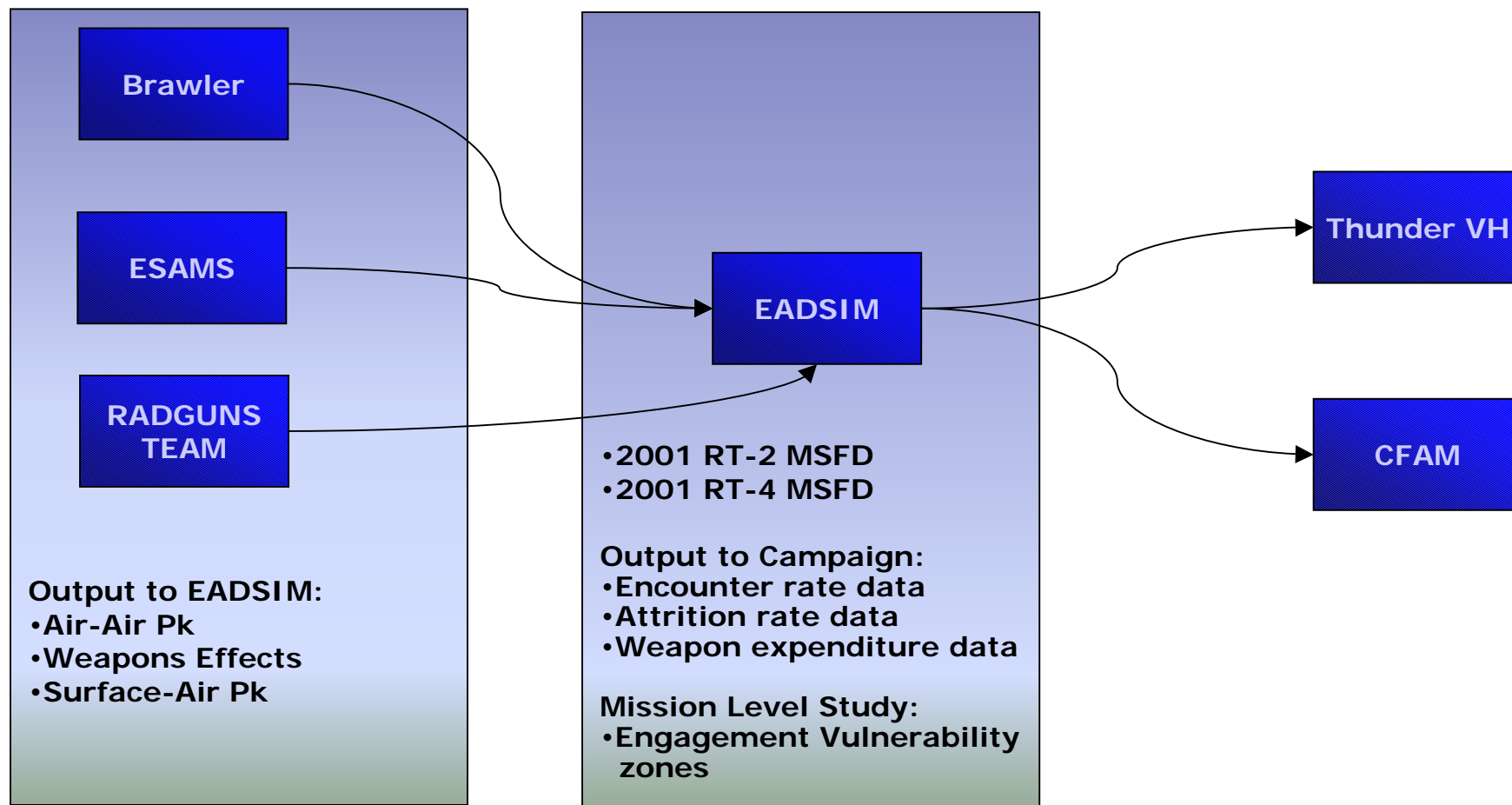




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EADSIM

Input to THUNDER & CFAM

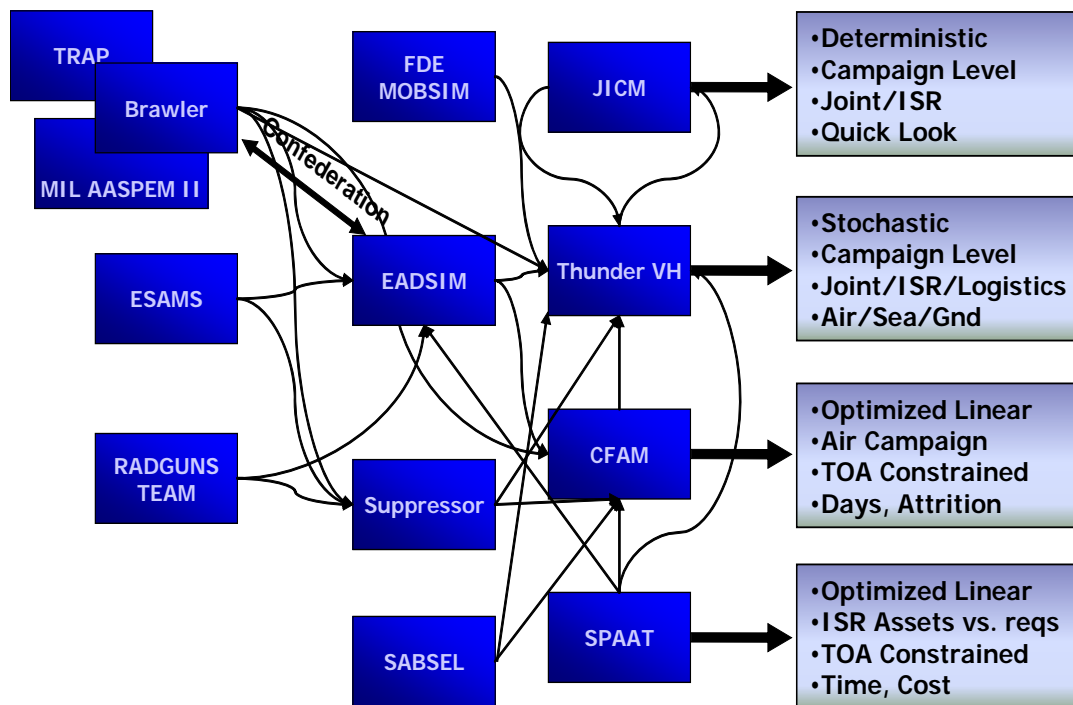




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S&V Impact Analysis

Consistent Scenario, CONOPS & Data Set



To answer high level questions to show the impact of S&V, Analyst must use

- Same scenario
- CONOPS
- Data sets

for all levels of M&S and data generation.

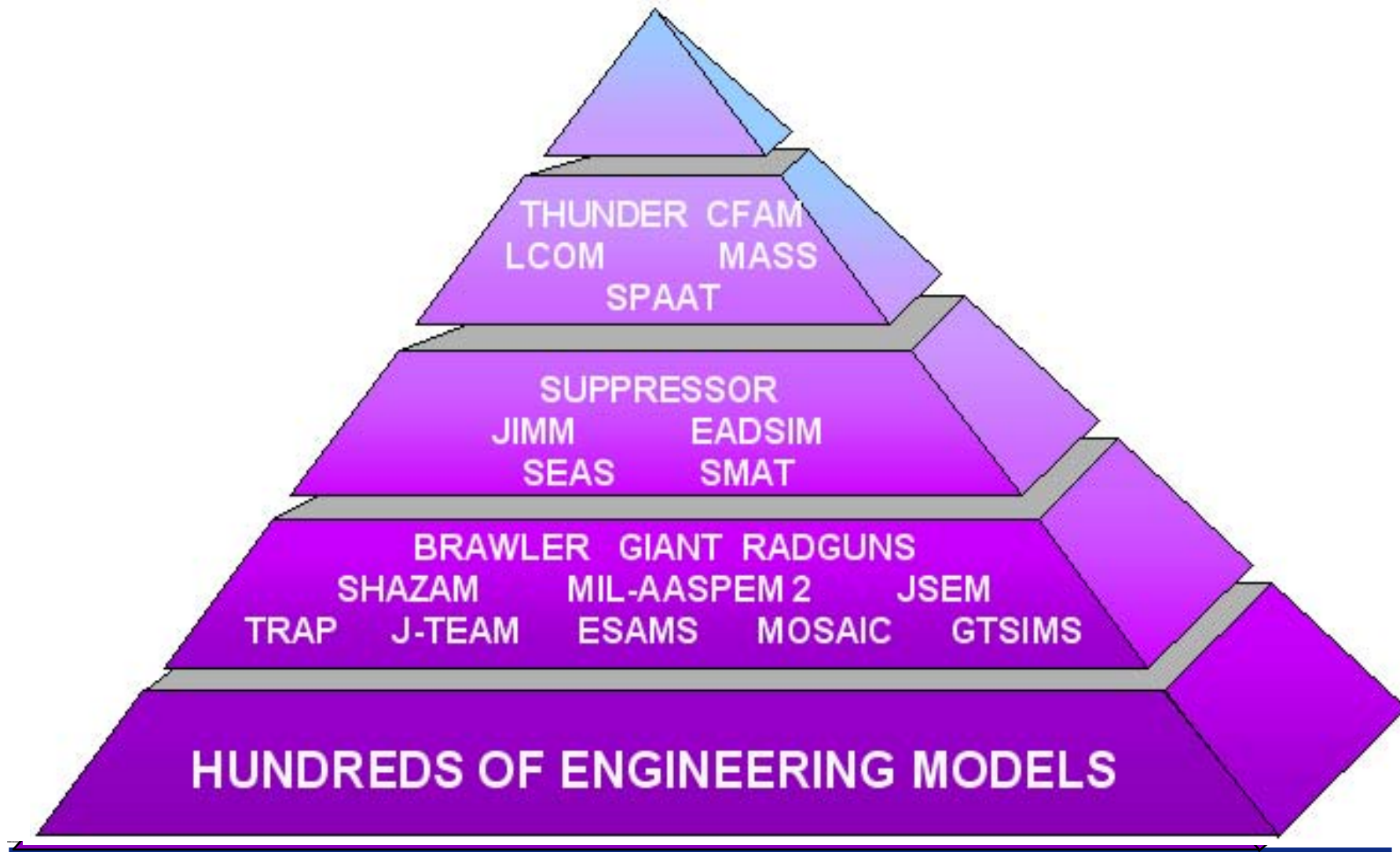


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Campaign Level *Summary*



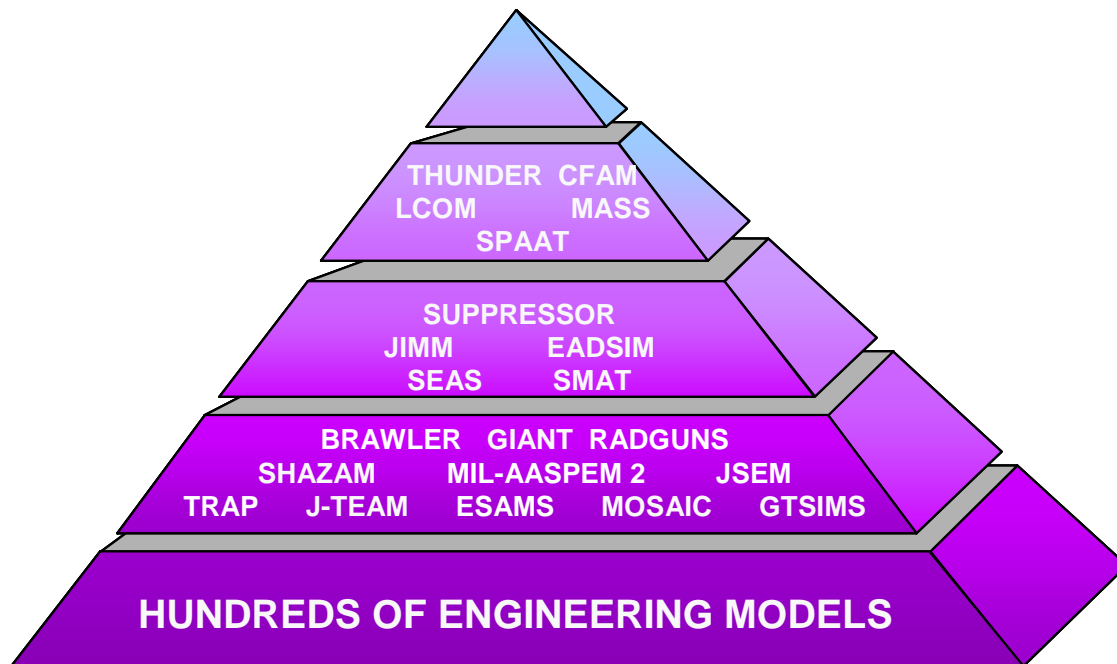
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AFSAT Value Added *Summary*

- AF Analytic Community approved set of M&S
- Ability to demonstrate S&V impacts at mission and campaign levels



Air Force Standard Analysis Tool Kit

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